TABLE XIII.—EXPERIMENTS ON OVERFALLS, CHEW MAGNA. (Continued.)

| Total Depth of Water above Crest, in inches. | Time in seconds. | Cubic Feet Discharged. | | | | Coefficients. | |
|---|---|---|---|---|---|---|---|
| | | Total Quantity. | Per Second. | Average per second. | Per second for 1 foot in width. | *m* | *k* |
| 6 | 27¼ | 385·71 | 14·150 | 14·150 | 1·415 | ·499 | |
| 6 | 27¼ | 385·71 | 14·150 | | | | |
| 6 3/16 | 28½ | 399·79 | 14·030 | 14·030 | 1·403 | | |
| 6 3/16 | 27¾ | 398·79 | 14·370 | 14·030 | 1·443 | ·499 | |
| 6 3/16 | 27⅕ | 398·79 | 14·500 | | | | |
| 6 3/16 to 6¼ | 26¾ | 399·79 | 14·900 | 14·900 | 1·490 | ·498 | |
| 6 15/16 | 21¼ | 385·71 | 18·150 | 18·150 | 1·815 | ·515 | |
| 6 15/16 | 21¼ | 385·71 | 18·150 | | | | |
| 7 1/32 | 20⅕ | 398·79 | 19·450 | 19·610 | 1·961 | ·478 | |
| 7 1/32 | 20¼ | 398·79 | 19·690 | | | | |
| 7 1/32 | 20¼ | 399·30 | 19·690 | | | | |
| 8 | 16½ | 385·71 | 23·380 | 23·380 | 2·338 | ·535 | |
| 8 | 16⅕ | 385·71 | 23·380 | | | | |
| 8 to 8 1/16 | 15½ | 384·71 | 24·820 | 24·820 | 2·482 | ·491 | |
| 8 15/16 | 15½ | 384·71 | 24·820 | 24·820 | 2·482 | ·500 | |
| 9 | 14 | 385·71 | 27·550 | 27·550 | 2·755 | ·521 | |
| 9 | | | | | | | |
| 9 | | 383·71 | 27·550 | | | | |
| | | | | | Mean | ·480 | |

The first twelve tables give the results of the experiments made on the Kennet and Avon Canal, where the reservoir was large, in proportion to the overfall, and the water was still.

Table XIII. contains the results of the experiments made at Chew Magna, in Somersetshire, in which the reservoir was very small, in proportion to the overfall, and it was kept continually supplied by a pipe 2 feet in diameter, leading from a reservoir 19 feet above it. The columns, in this case also, have the same signification as those relating to the experiments on the Kennet and Avon Canal.

(To be Continued.)

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For the Journal of the Franklin Institute.

## *Notice of a Railroad upon an Ice Grade.* *By* ELLWOOD MORRIS, *Civil Engineer.*

The railroad lately laid upon a graduation of ice, provided by nature across the mouth of the Susquehanna river, at Havre de Grace, in the State of Maryland, seems to deserve a more permanent record than the fleeting notices of the daily press.

It adds another to the many striking evidences recently afforded, of the promptitude with which the mind of the American engineer and mechanic grapples with unexpected difficulties, and triumphs over them.

The railroad uniting the cities of Baltimore and Philadelphia, touches both banks of the Susquehanna river at its mouth.

The river here is about four-fifths of a mile in width, and forming a break in the railroad of that length, over deep water; the communication is usually kept up by means of a large steam ferry boat, upon which the passengers cross from one bank to the other, independent trains with their locomotives being in waiting upon both banks.

The passengers themselves debark, when they reach the river, and gain the boat through covered buildings, which screen them from the weather; their baggage, with the car containing it, is run upon the upper deck, and being carried over is replaced upon the railway on the further bank, and coupled to the train in waiting there.

Now the river Susquehanna, leading to the north, in bleak and mountainous regiôns, brings down in the winter season, great quantities of floating ice, which seriously impede the railroad ferry.

At the mouth of the river there is shoal water, in which the ice grounds, and in severe weather, it forms a point of support for successive floating masses, until it sometimes gorges up for many miles above the ferry of the railway line.

In forming these "*gorges*" of ice, the cakes edge up, and freezing together in that position, form a mass of great solidity and strength, but very rough upon the surface.

While this gorge is forming, the railroad ferry is necessarily discontinued, and when it has formed, the question arises—how is the business of the railway to be resumed?

These preliminary remarks bring us now to our main subject: In a severe winter like that of 1851-2, the engineer of the railway sees his ferry line at Havre de Grace cut off, and the river filled almost to the bottom with a vast accumulation of cakes of ice, a foot thick, edged up, and frozen in that position, so as to present a mass of great strength, but most forbidding superficial aspect.

Contemplating this with the true eye of science, and seeing its adaptation to his purpose, Mr. Trimble, the engineer of the railroad company, determined to form over this rude glacier, *a railroad* for his baggage and freight cars, and *a sledge road* along side of it, upon which two horse sleighs could carry his passengers, and by means of towing lines, propel the freight cars over the river. This was the great idea, and most promptly and successfully has it been carried out.

The first step was to *locate* the railroad; for upon this rough surface of ice, a straight line between the ferry landings, would have required too much graduation; too much excavation and embankment, (so to speak,) of ice and snow.

The line was accordingly staked out with several curves, so as to reduce the labor required in grading the frozen surface; the projections, points, and ridges were cut away, and broken fragments of ice were used to fill up the hollows. Then upon condemned ties, about four feet apart, with some new timber interspersed, a track was laid with U rails, of about 40 lbs. to the yard, confined merely by hook-headed spikes, and without chairs.

The surface of the ice being some 10 or 15 feet below the permanent

rails upon the two banks, was gained by temporary inclines, running off from the shores upon a rough blocking of cob work, so arranged as to be adjustable, and taking advantage of a low pier on the left bank, to reduce the grade. These inclines, and the track across the ice, were connected with the main line on both banks, by suitable switches, and formed in fact a species of sideling nearly a mile long. Upon the inclines the baggage and freight cars were worked one way by *gravity*, and the other by *roping*, from the locomotive train. Forty freight cars per day, laden with valuable merchandise, have been worked over this novel track by the means above referred to, and were propelled across the ice portion by two horse sleds running upon the *sledge road*, and drawing the cars by a lateral towing line, of the size of a man's finger.

At the present writing, this novel and effectual means of maintaining the communication at Havre de Grace, is still in successful operation, and will so continue until the ice in the river is about to break up. Then by means of the sledges, the rails, (the only valuable part of the track,) can be rapidly moved off by horse power, not probably requiring more than a few hours time, so that the communication may be maintained successfully until the last moment. If properly timed, (as it doubtless will be,) the railroad may be removed, the ice may run out, and the ferry be resumed, it may be, in less than 48 hours.

We cannot conclude this brief notice by an eye witness, without expressing our admiration of the ingenious practical arrangement, adopted for overcoming an extraordinary difficulty at this point, by Isaac R. Trimble, Esq., the engineer of the railroad company.

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### *The Submarine Telegraph.**

At about half past 10 o'clock on Thursday morning the last portion of the wire leading from the Foreland was brought close under the walls of the Castle at the summit of the cliff, and thence gently dropped into the garden attached to the temporary office of the Company. The wire was then led into one of the upper rooms and connected with the telegraphic instruments. In addition to the well known apparatus of Messrs. Cooke and Wheatstone, the more modern inventions of Messrs. Brett and Henley had been enlisted for the occasion. After some little delay, consequent on the rapidity with which the arrangements were made, the wires were finally connected, and it became a moment of intense anxiety when signals were about to be passed. The instrument of Messrs. Cooke and Wheatstone was set in motion, signals were interchanged with Calais, and the complete success of the undertaking was completely evinced. But very few communications had passed when a mounted messenger arrived with a despatch from the telegraph office of the South Eastern Railway Company. It proved to be a communication containing the prices of the funds on the London Exchange, which were to be immediately sent on by the submarine telegraph to Paris. The particulars of the message were of course kept secret, but it was gratifying to observe that it was duly forwarded. From this time despatches were continually passing between the Dover telegraph offices and London and Paris. A message from

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